AUSTRALOSUTURA GEN. NOV. (TRILOBITA) FROM THE CARBONIFEROUS OF AUSTRALIA AND ARGENTINA

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ABSTRACT. A revised description of the Carboniferous trilobite *Cordania gardneri* Mitchell 1922 is given, based on some topotype material from Australia, and new material from Argentina. The species is assigned to a new genus *Australosutura* Campbell and Goldring 1960.

LOCATION AND STRATIGRAPHY OF MATERIAL FROM AUSTRALIA

Australosutura gardneri was first described by Mitchell (1922, p. 536) from the shore of Lake Boolambayt, one of the Myall lakes north of Newcastle, New South Wales. The stratigraphy of this area is still poorly known, though it is being studied at the present time. The specimens of *A. gardneri* occur in a richly fossiliferous bed an unknown interval (some hundreds of feet at least) above a very prominent sandstone containing the brachiopod *Marginirugus barringtonensis alatus* Campbell 1956, which is considered to be of Lower Viséan age. Fortunately the species is known from two other New South Wales localities where the stratigraphy has been more adequately studied; the Barrington area (Voisey 1940), and the Booral area (Osborne 1950); the successions in these areas have been re-examined recently, and the results are set out in the accompanying columns (text-fig. 1).

In all three areas *A. gardneri* is associated with a very distinctive fauna dominated by the productid *Levipustula* Maxwell 1957 and an undescribed acrospiriferid. However, though all three faunas have many elements in common and are quite distinct even at the generic level from the earlier Carboniferous faunas, they are not identical, and it is possible that they are only approximately contemporaneous.

The *Levipustula* fauna is also very prominent in Queensland where it occurs extensively in the Neerkol mudstones which overlie the late Viséan limestones of the Rockhampton Series of the Rockhampton area, and the Turner Creek Clastics of the Mt. Morgan area, the upper parts of which are Viséan (Hill 1934; Maxwell 1954). The Neerkol mudstones are generally considered by Queensland geologists to be of Muscovian age. Study of the brachiopods, bryozoa, and molluscs of the *Levipustula* faunas of the three New South Wales localities indicates a Westphalian age and hence broadly confirms the Queensland determination. A systematic study of the fauna is to be published shortly.

The most significant fossils for the determination of age are: Spirifers similar to the Pennsylvanian *Neospirifer triplicatus* (Hall); *Lissochonetes*, which is known only from post-Viséan deposits elsewhere; *Levipustula*, which is common in the Westphalian of western Europe, but is not yet known from elsewhere; *Limipecten*, which, although it is known from the Viséan of western Europe, does not appear until the Upper Carboniferous elsewhere in the world. None of the associated fifteen genera of fossils, many of them endemic, suggests an earlier age. K. S. W. C.

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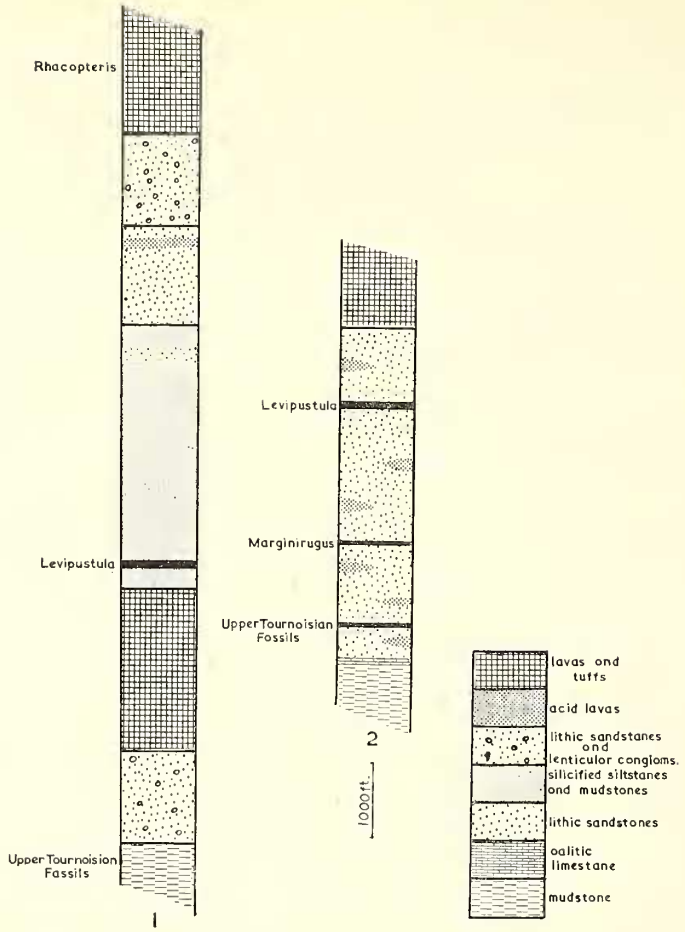

TEXT-FIG. 1. (1) Generalized stratigraphic succession east of the township of Booral on the south-eastern side of the Gloucester trough, New South Wales. (2) Generalized stratigraphic succession between Barrington and the Gloucester River, on the north-eastern side of the Gloucester trough, New South Wales.

LOCATION AND STRATIGRAPHY OF MATERIAL FROM ARGENTINA

The specimens from Argentina came from three localities in the west of the Province of Chubut: (1) La Carlota, about 8 km. south-east of Tecka, (2) Cerro Mina, east of Sierra de Languineo and 75 km. east of Tecka, and (3) Sierra de Tepuel, about 25 km. south of Tecka. At these three localities the trilobites were found in silicious nodules at the top of the lower section of the 5,200 m. of Upper Palaeozoic sediments exposed in the Sierra de Tepuel, Sierra de Languineo, and Sierra de Tecka of Suero's (1948, 1953) 'Tepuel System'.

The lower section, 3,200 m. thick, consists of glacimarine conglomerates together with sandstones, quartzites, and greywackes with intercalated shales. The upper section,

2,000 m. thick, differs from the lower by the absence of glacial conglomerates and greywackes, but includes micaceous sandstones and shales with well-preserved plant remains.

The lower section has yielded brachiopods, pelecypods, bryozoans, gastropods, conulariids, corals, and fish scales. The upper section has also yielded brachipods including *Levipustula*, and the brachiopods from both sections are now being studied (Amos, in press). In the upper section goniatites have been found. Miller and Garner (1953, p. 821) described *Anthracoceras? argentinense* Miller and Garner 1953 and *Eoasianites sp. A.? argentinense*, although found at La Carlota together with the trilobites, was not found *in situ* but came from a pebble of dark limestone. Curiously no limestone beds are exposed in the neighbourhood and possibly the pebble came from a bed no longer exposed. Miller and Garner gave the age of the goniatites as Middle Pennsylvanian (Westphalian). Amos considers the age of the lower section to be Viséan on brachiopod evidence.

A. J. A.

DESCRIPTION

Family BRACHYMETOPIDAE Prantl and Přibyl 1950 emended Hupé 1955

AUSTRALOSUTURA gen. nov.

Type species *Cordania gardneri* Mitchell 1922

Derivation of name. From the southern hemisphere, and with facial sutures.

Range. Carboniferous. The age of the beds in which the trilobites occur is not known with certainty either in New South Wales or in Argentina. Although it is suggested that the age of the beds in Argentina is Viséan it is thought that the age of the beds in Australia is Westphalian. Further research may produce more conclusive data for the age determination in both countries.

Distribution. New South Wales, Burindi, and Kuttung Series; Argentina, top of lower section of 'Tepuel System'.

Diagnosis. Cephalon and glabella strongly inflated. Glabella subcylindrical with prominent, subtriangular basal lobes and deep glabellar furrows 1p. Glabellar furrows 2p clear. Preglabellar field short and high. Very broad, concave, and pitted border furrow preceded by short convex border. Sublunate, strongly convex eyes. Long genal spines. Facial suture curves strongly away from eye. β on crest of border and ω just inside genal spines. Surface of cheek area, preglabellar field, glabella and occipital ring with numerous tubercles. Thorax of nine tuberculate segments. Pygidium with fifteen rings and nine (+1–2) ribs. Axis semioctagonal in cross-section, and overhanging postaxial portion, but not border. Rings strongly arched and tuberculate with prominent median row. Ribs with anterior portions twice as strong as posterior portions and both tuberculate.

Comparisons with other genera. Mitchell (1922, p. 537) concluded that *A. gardneri* could not be included in either *Phillipsia* Portlock 1843 or *Griffithides* Portlock 1843. He commented on its very close similarity to species of *Brachymetopus* M'Coy 1847, but decided that the presence of facial sutures prevented its inclusion with this genus. On the suggestion of Vogdes he finally assigned the species to *Cordania* Clarke 1892.

The cephala of *Cordania* and *Australosutura* are similar in each having a highly inflated glabella, faint glabellar furrows 2p, and prominent detaehed basal lobes. In *Australosutura* the glabella is relatively longer, and the preglabellar field shorter and

steeper. Both genera have nine thoracic segments. The pygidia differ considerably. In *Cordania* it is transversely elliptical; in *Australosutura* it is comparatively longer, has a greater number of rings and ribs, fifteen rings and nine (+1–2) ribs as against thirteen rings and eight ribs in *Cordania cyclurus* (Hall and Clarke 1888), and the termination of the axis overhangs the postaxial portion, though not the border. The form and surface of the rings and ribs differ; in *Cordania* the anterior and posterior portions of the ribs are about equally developed and bear granules in addition to the tubercles on the anterior portions. Both portions continue to the margin.

In much of the material from Australia and Argentina the free cheeks are attached to the cranidium, and Mitchell (1922, p. 538) considered that fusion of the cheeks had begun. Whittington (personal communication) regards the facial suture of *Cordania* as normal and functional. Since isolated free cheeks and cranidia of *Australosutura* have been found in Australia the facial suture cannot be regarded as otherwise than functional. *Cordania* may possibly be ancestral to *Australosutura*.

Australosutura differs from the type species of *Brachymetopus* (type species *Phillipsia maccoyi* Portlock 1843, Goldring and Stubblefield 1957, p. 421) in possessing facial sutures, a longer glabella, and shorter preglabellar field. The details of the skeletal surface, in particular, the pair of prominent tubercles between the glabella and the anterior part of the eye, the row of tubercles on the border of the cephalon, and the tubercles on the pygidial axis, are very similar to that present in *B. maccoyi* and in *B. woodwardi* Whidborne 1896 (Goldring 1955). *B. strzeleckii* M'Coy 1847 also has similar features though the glabella is much shorter than in *A. gardneri*. In *B. ouralica* de Verneuil 1845 the anterior border is less arched than in either *A. gardneri* or *B. maccoyi*. The pygidium of *A. gardneri* is close to *B. maccoyi* and *B. ouralica* though the median tubercles of *A. gardneri* are of more even size on successive rings; the ribs of *B. woodwardi* and *B. maccoyi* are very similar to those of *A. gardneri*, but the ribs of *B. ouralicus* bear a greater number of tubercles on both portions.

Australosutura gardneri (Mitchell 1922)

Plates 39, 40

1922 *Cordania gardneri*, n. sp.—Mitchell, p. 536, pl. 54, figs. 1–7.
1924 *Cordania gardneri* Mitchell—Mitchell, p. 53, pl. 10, fig. 15.

Derivation of name. After Frank Gardner who first brought the species to notice.

Lectotype. Broken cephalon figured by Mitchell (1922, pl. 54, fig. 1, Australian Museum, Sydney, F.26974). Of the several specimens figured by Mitchell, those figured as pl. 54, figs. 2–5 and 7 are missing. Figure 6 of the same plate may be a reconstruction of F.27345. The specimen Mitchell figured later (1924, pl. 10, fig. 15) is F.27949.

Type locality. Brambles Farm, Myall Lakes, Eurenderee, Gloucester, New South Wales. Shore of Lake Boolambayt near grid reference 341812, Port Stephens, 1 inch: 1 mile Military Sheet.

Horizon. Upper Burindi Series (Voisey 1940, p. 196; David 1950, p. 290), Upper Kuttung Series (Osborne 1950, p. 24).

Material. Complete dorsal exoskeletons, together with independent cephala, thoracic segments, and pygidia. No hypostomes. The material from Argentina occurs as external and internal moulds in siliceous nodules and shows little or no sign of distortion. The Australian material occurs as internal and external moulds in very fine grained sandstones and siltstones at the type locality. Specimens are

mostly distorted. The type of preservation at the other Australian localities is similar, but the sediments are coarser grained.

Diagnosis. As for the genus.

Description of material from Argentina. Cephalon. Side view. Outline of the glabella almost a quadrant, with occipital ring prominently arched, in one specimen (Museo la Plata, Coll. Suero 5024) as high as the glabella, and occipital furrow strongly rounded. Preglabellar furrow broad, shallow, and facing anteriorly. Preglabellar area short (sag.) almost vertical, bearing strong tubercles, which terminate abruptly at commencement of border furrow. The border furrow has irregularly arranged pits, of varying sizes (8–10 per sq. mm.) and is strongly concave, though the side towards the glabella is a straight slope at 45°. Border a moderately convex ridge which bears tubercles near top of posterior slope.

Front view. Occipital ring strongly arched with glabella similarly arched in front. Laterally basal lobes project beyond outline of occipital ring. Palpebral lobes slope upwards from axial furrows to prominent and strongly convex eyes. In outline posterior border of each cheek appears from behind eye and falls steeply towards genal spine. Below eye cheek descends with only slight convex slope to border furrow.

Plan. Excluding genal spines, outline of cephalon, subsemicircular, with length (sag.) rather greater than half breadth. Glabella subcylindrical, tapering anteriorly sharply between basal lobes, less so between lobes 2p and expanding very slightly beyond glabellar furrows 2p before broad, rounded termination. Basal lobes subtriangular and well defined. Glabellar furrow 1p sharp and very deep at axial furrows, becoming broad and shallow at bifurcation. Posterior branch merges into occipital furrow and anterior branch extends shortly on to glabella. Glabellar furrow 2p a broad, smooth knick, and glabellar lobe 2p only slightly inflated. No evidence from tuberculation of any more glabellar furrows. Occipital furrow deep and narrow posterior to basal lobes, expanding towards axial furrow and at junction with furrow 1p where it arches forward and becomes broad and shallow. Posterior to basal lobes, occipital ring very short (exsag.), but expanding where glabellar furrows 1p join the occipital furrow to twice this length (sag.). Small occipital node.

Area of fixed and free cheek broad. Centre of eye opposite junction of glabellar furrow 1p with axial furrow, and surrounded laterally by smooth terrace which extends to opposite glabellar furrow 2p and to half length of basal lobe. Palpebral lobe smooth. At axial furrow length of posterior border less than length of occipital ring, but border widens laterally. It is strongly convex and continues with equal prominence along genal spine. Posterior border furrow broad and smooth though narrower near axial furrow. Lateral border furrow very broad and pitted, joining posterior border furrow and continuing, with pits, down genal spine. Lateral border gently rounded, tapering gradually to base of genal spine, and then more strongly down it. Genal spine extends to fifth thoracic segment. Eye sublunate with minute facets.

Facial suture. Anterior branch curves strongly outwards, crosses border furrow and then turns inwards to margin; β at crest of border. Posterior branch curves sharply outwards and terminates only just inside base of genal spine, and rather farther from the median line than β.

Surface. Cheek area and preglabellar field with numerous close-set tubercles of variable

size (3–4 per sq. mm.), many with apical openings; one is particularly prominent on fixed cheek opposite glabellar furrow 2p. A row of slightly enlarged tubercles between palpebral lobe and axial furrow. Posterior part of fixed cheek smoother and with only a few small tubercles. Glabellar and occipital ring with tubercles of about equal size to those on cheek, but less closely spaced, and on crest of glabella very weak (on available material). Tubercles on basal lobe larger on inner part than toward axial furrow. Top of inner slope of border with a single row of tubercles which weaken laterally and are scarcely discernible along genal spine. Outer slope of lateral border and continuation of posterior border along genal spine with fine parallel terrace lines.

On ventral surface doublure, including rostrum, covered with terrace lines, and equal in breadth to border furrow plus border of dorsal surface. Facial suture continues inward course over anterior margin and meets rostral suture (rr) just below margin. There is no short connective suture but a suture ($r\omega$), which has a course comparable to that of the perrostral suture of olenellids, makes an acute angle with the facial suture and swings outwards in a long sweeping curve to cut the posterior border of the cephalon just inside the genal spine, and immediately below the termination of the facial suture on the dorsal surface. This suture makes a definite angle with the rostral suture (rr), equal to the angle between the rostral suture and the facial suture. Inner margin of doublure (in part, presumably, hypostomal suture) long and curved, following, and lying immediately and closely under inner margin of border furrow. Doublure of free

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EXPLANATION OF PLATE 39

Material from Argentina

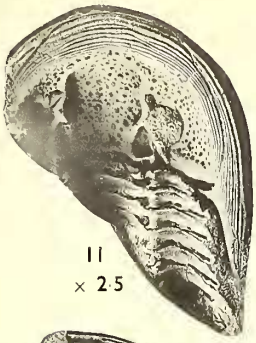
Figs. 1–11. *Australosutura gardneri* (Mitchell 1922). 1–7, Latex cast from external mould of complete specimen (BM In 53675). Province of Chubut, Sierra de Tepuel, about 25 km. south of Tecka. 1, Plan, 2, front view, 3, side view of cephalon, 4, posterior view. 5, Side view of pygidium, ×2. 6, Free cheek, showing puncta in border furrow, and apical openings on cheek tubercles, ×5. 7, Portion showing method of articulation of segments, ×4. 8, 9, Latex casts from external moulds of pygidia, Province of Chubut, La Carlota, about 8 km. south-east of Tecka. 8, ×4 (Coll. Suero 5049, 5051). 9, ×2 (BM In 53676). 10, 11, Latex casts from internal moulds of dorsal surface of cephala showing rostral plate and ventral surface of free cheek, Province of Chubut, Cerro Mina, east of Sierra de Languineo, 75 km. east of Tecka, 10, ×2·5 (Coll. Suero 5029), 11, ×2·5 (Coll. Suero 5023).

EXPLANATION OF PLATE 40

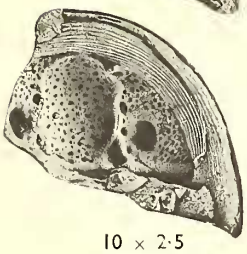
Material from Australia

All specimens are from type locality. Catalogue numbers refer to the Australian Museum Collections. Specimens figured as numbers 9, 10, 13, 14, and 15 have been destroyed by fire.

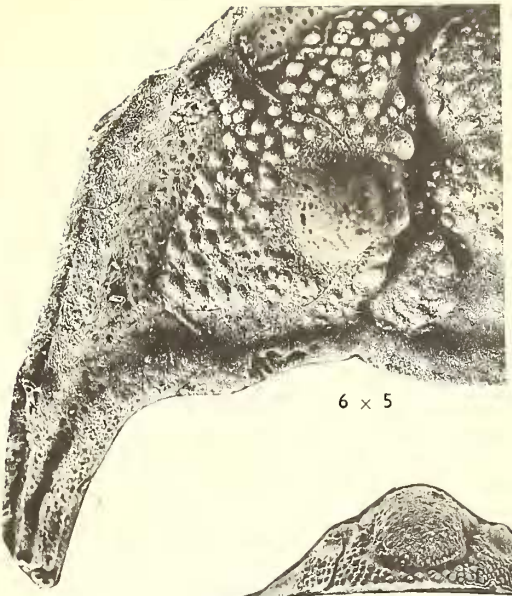
Figs. 1–20. *Australosutura gardneri* (Mitchell 1922). 1, Latex cast from internal mould of F.44640, ×2. 2, 3, Dorsal and lateral views of internal mould of same specimen, ×2. 4, Lectotype, F.26974, ×2 (Mitchell 1922, pl. 54, fig. 1). 5, Latex cast from internal mould of free cheek, part of ventral surface of cephalon, and pygidium, F.26476c–e, ×2. 6, Ventral surface of same cephalon showing position of rostrum, ×3. 7, 8, Lateral and posterior views of same pygidium, ×2. 9, Dorsal view of same pygidium, ×3. 10, Interior view of latex cast from internal mould of cephalon, ×3. 11, Interior view of latex cast from internal mould of pygidium F.26476, ×2. 12, Latex cast from external mould of pygidium, ×3. 13, Posterior view of latex cast from external mould of incomplete pygidium, ×3. 14–16, Latex casts from external moulds of fragmentary cephalons, 14, 15, ×3, 16, F.25593, ×2. 17, Lateral view of latex cast from external mould of part of cephalon, showing facial suture, F.26476a, ×2. 18–20, Dorsal and lateral views of internal mould, F.27949, 18, ×2·2, 19, ×1·8, 20, ×2·2 (Mitchell 1925, pl. 10, fig. 15).



11
× 2·5

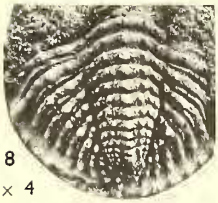


10 × 2·5



6 × 5

2 × 2



8
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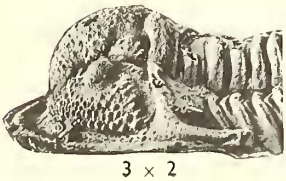
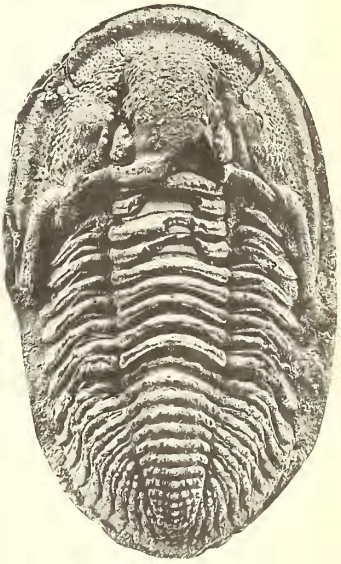


3 × 2



1 × 2

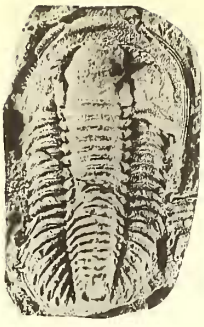
9 × 2

5 × 2

4 × 2

7 × 4

1 × 2



2 × 2

3 × 3

4 × 2

6 × 3

10 × 3

5 × 2

7 × 2

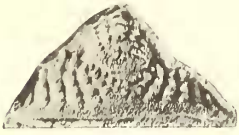
8 × 2

9 × 3

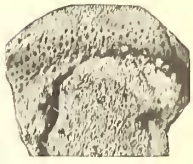
14 × 3

11 × 2

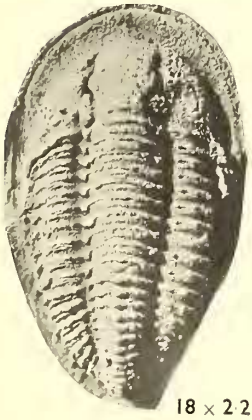
12 × 3



13 × 3

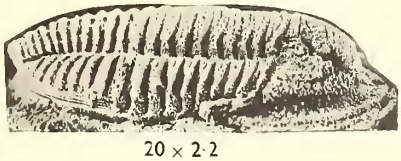


15 × 3



18 × 2·2

19 × 1·8



20 × 2·2

16 × 2

17 × 2